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QUANAH WHEAT

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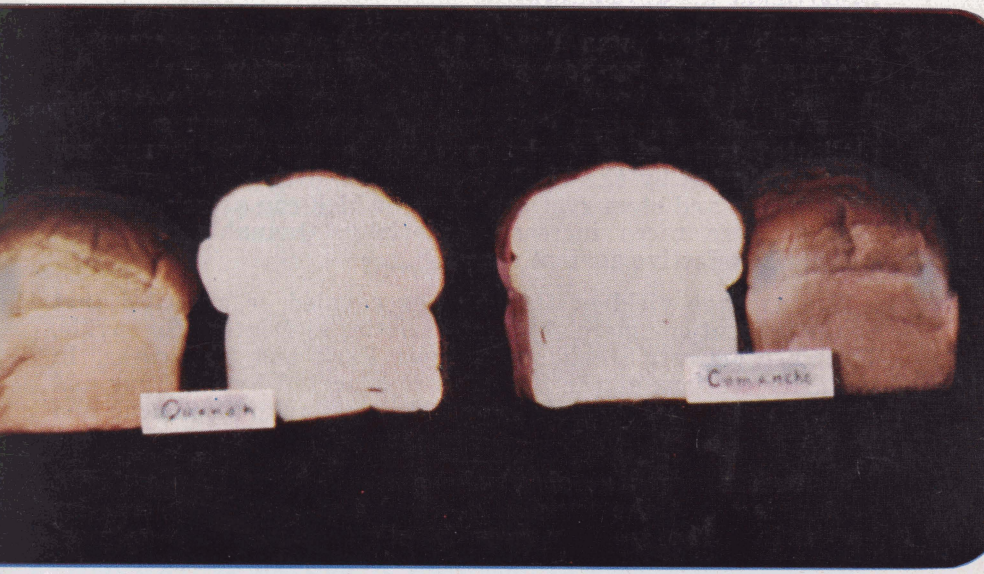

Commercial type loaves baked from Quanah and Comanche wheat

In cooperation with the
UNITED STATES DEPARTMENT OF AGRICULTURE

The TEXAS AGRICULTURAL AND MECHANICAL COLLEGE SYSTEM
GIBB GILCHRIST, Chancellor

Digest

This bulletin reports the development and characteristics of Quanah, a new disease-resistant hard red winter wheat of excellent quality, which is now available to Texas farmers.

This new variety was developed in the cooperative small grain improvement program of the Texas Agricultural Experiment Station and the Division of Cereal Crops and Diseases, Bureau of Plant Industry, Soils and Agricultural Engineering, U. S. Department of Agriculture.

Quanah wheat was developed from a complex cross of (Comanche x Honor-Forward) x (Mediterranean-Hope x Comanche). It has shown a high degree of resistance to common races of leaf and stem rust, and to bunt (stinking smut) in replicated tests at several Texas substations and in regional tests conducted by the U. S. Department of Agriculture. Races of both leaf and stem rust are known which can attack Quanah. Should these races increase materially, Quanah's resistance will not be effective against them.

The average yield of Quanah has equaled or exceeded that of the present commercial wheat varieties at Denton, Greenville, Temple, Comfort, Stephenville, Iowa Park and Chillicothe. In the drier sections of the State, as represented by the Spur and Amarillo stations, Quanah has yielded less than Comanche and Westar.

Quanah matures at about the same time as its Comanche parent, is about the same height and stands well for combine harvesting. The seedling growth is more upright than most hard red winter wheats; therefore, it may be damaged more by close grazing or grazing late in the spring. The variety is sufficiently winter-hardy for the recommended area of the Rolling Plains and Central Texas, but should not be grown outside these areas.

Quanah is similar to Comanche in milling and baking characteristics. Tests by commercial and institutional laboratories show that it is satisfactory for the production of bakery flour.

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Quanah Wheat

I. M. ATKINS*

WINTER WHEAT is grown in Texas on more than five million acres annually and is one of the most important cash crops. Approximately half of this acreage is on the High Plains, or Panhandle area, in the northwestern part of the State. The other half is grown in the Rolling Plains and North-Central Texas areas.

Diseases play an important role in crop production, especially in the Rolling Plains and Central Texas, and often limit crop yields. For example, in 1949, plant diseases caused an estimated loss of 24 million bushels of wheat in Texas. Leaf and stem rust are the most serious diseases of wheat in the State. These diseases overwinter and develop early in the season in Texas, then spread to wheat-growing areas of states to the north. Consequently, the development and distribution of Quanah wheat, which is resistant to the common races of these diseases, may also serve to reduce losses in other states.

Development

Quanah wheat was developed from a complex cross in which the first generations of two hybrids were crossed. The parentage was (Comanche x Honor-Forward, Cornell 501e-I-28, F_1) x (Mediterranean-Hope, 41-33-1-J13 x Comanche, F_1).

In making the cross, it was hoped to combine the adaptation, resistance to bunt (stinking smut) and good baking quality of Comanche with the leaf and stem rust resistance of the Mediterranean-Hope strain and the loose smut resistance of the Honor-Forward strain. The latter strain proved to be susceptible to local races of loose smut. The cross was made in 1938 and the strain which later became Quanah wheat was selected in 1943. The strain showed promise in the early testing stages and was advanced rapidly in the program.

Quanah was tested in uniform preliminary nursery plots at three locations in Texas in 1945 and in replicated tests at several locations in 1946. Since 1947, it has been included in the Hard Red Winter Wheat Uniform Yield Nursery of the U. S. Department of Agriculture, which is grown throughout the Great Plains region. This nursery is referred to hereafter as the USDA regional nursery.

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Yields

Quanah wheat was tested at several stations in Texas from 2 to 6 years. It showed its greatest superiority over present commercial varieties in tests at Denton, Greenville, Stephenville, Temple and Comfort. Yields of Quanah and several important commercial varieties, including its Comanche parent, are given in Table 1 for several locations in Texas and in the USDA regional nursery.

Table 1. Yields of Quanah and seven commercial varieties of winter wheat at Texas substations and in the USDA regional nursery, 1945-50

Location	No. years tested	Grain yield, bushels per acre							
		Quanah	Comanche	Westar	Kharkof	Early Black-hull	Wichita	Triumph	Tenmarq
Denton	6	21.5	18.9	19.4	17.1	18.5	15.5	16.9	14.9
Greenville	3	20.9	18.5	.....	.....	19.0	17.5	18.5	16.4
Temple	3	23.0	16.2	.....	.....	11.6	3.8	6.4	6.4
Comfort	2	23.0	14.4	.....	13.0	13.5	6.1	.....	12.8
Stephenville	3	24.6	19.7	17.6	15.1	13.6	14.5	13.4	16.8
Spur	3	15.1	19.1	16.8	15.6	19.0	18.0	18.0	18.1
Iowa Park	4	33.5	33.1	31.9	29.5	34.1	33.4	30.8	29.9
Chillicothe	5	30.7	30.2	31.8	26.4	28.4	30.1	28.0	25.7
Amarillo	3	23.7	25.3	24.9	24.3	24.1	23.8	24.3	25.7
USDA regional nursery	4	29.6	32.3	32.6	29.7	30.0	30.0	31.8	.....

At the Central Texas stations of Denton, Greenville, Stephenville, Temple and Comfort, Quanah outyielded all other commercial varieties of wheat for the periods tested. Quanah averaged 22.6 bushels per acre, compared with 17.6 bushels for Comanche and 11.5 bushels for Wichita. All varieties, except Quanah, were materially damaged by rusts at one or more of these stations in both 1949 and 1950. In the severe epidemic of leaf rust at Stephenville in 1950, Quanah yielded 40.2 bushels per acre, compared with 22.2 bushels for Comanche and 17.3 bushels for Wichita.

At Amarillo and Spur, where moisture was a limiting factor in production during the testing period, Quanah yielded less than either Comanche or Westar. The variety appears to be less resistant to drouth and low temperatures than the present commercial varieties; therefore, it is not recommended for dry farming in the High Plains area.

In the USDA regional nursery tests at 13 to 15 stations in eight states of the Great Plains area, during 1947-50, Quanah averaged 2.7 bushels per acre less than Comanche but approximately the same as Kharkof, Wichita and Early Blackhull. Yields of Quanah were considerably reduced by winterkilling in the northern part of the Great Plains in 1949 and 1950.

Based on its record of performance, Quanah is recommended to replace the mixed hard and soft winter wheat now grown in

Central Texas, and as an additional high quality, disease-resistant variety for the Rolling Plains area. It has a more limited adaptation than its Comanche parent and should be grown only in the recommended areas in Texas. It is not recommended in other states.

A field of Quanah wheat is shown in Figure 1.

Figure 1. A field of Quanah wheat on the A. H. Yeatts Farm, Sanger, Texas, in 1950. This field yielded 28 bushels per acre, while a nearby field of Triumph averaged 14 bushels.

Disease Resistance

Quanah showed a high degree of resistance during the testing period to the races of leaf rust, stem rust and bunt prevalent in Texas and in the Great Plains area. New virulent races of leaf and stem rust are now known to be present in the United States; should these races increase materially, Quanah and other varieties that derive their resistance from Hope wheat, may be damaged.

Since all commercial varieties of hard red winter wheat now grown in Texas are susceptible to rust, Quanah is compared only with Comanche and Kharkof.

Percentages of leaf rust, stem rust and bunt in tests in Texas and in the regional nurseries, are given in Table 2. Percentages of leaf and stem rust are given as estimated percentages of plant tissue covered by rust pustules. Actual percentages of smutted heads were determined by a count on plants grown from seed dusted with smut spores.

Leaf rust readings taken at seven locations in Texas show that Quanah averaged only 3.5 percent, compared with 30.8

Table 2. Percentage infection of Quanah, Comanche and Kharkof wheats of leaf rust, stem rust and bunt (stinking smut) at several locations in Texas and in the USDA regional nursery, 1946–50

Locations	Number years tested	Variety		
		Quanah	Comanche	Kharkof
		Percent leaf rust		
Denton	5	6	30	45
Greenville	3	T	22	.....
Temple	3	3	13	.....
Comfort	2	3	43	57
Chillicothe	4	1	29	38
Iowa Park	2	6	37	65
Stephenville	3	6	29	60
Amarillo	2	3	43	50
Average	.....	3.5	30.8	52.5
USDA regional nursery	4	2.8	33.0	37.8
		Percent stem rust		
Denton	5	.....	3	8
Comfort	2	.....	10	10
USDA regional nursery	4	T	18	26
		Percent bunt		
Denton	3	1	1	18
USDA regional nursery	3	9	9	37

percent for Comanche and 52.5 percent for Kharkof. Similar relative infections were recorded in the regional test. This high leaf-rust resistance permitted Quanah to produce good yields of high quality grain in increase fields at Greenville, Denton and Chillicothe in 1949 and 1950, when many commercial varieties were seriously damaged by these diseases.

Only limited observations on stem rust reaction were obtained as this disease was not serious during the testing period. Quanah was highly resistant in all instances. Quanah showed only a trace of stem rust infection in the USDA regional nursery; while, in the same tests, its Comanche parent averaged 18 percent and Kharkof 26 percent infection. This resistance is not effective against race 15 B of stem rust or certain virulent races of leaf rust. Should these races increase materially, Quanah may be damaged along with other varieties.

Grain and sheaf samples of Quanah and Comanche wheat grown at Denton in 1949, when Comanche was damaged by stem rust, are shown in Figure 2. In this test, Comanche yielded 14.0 bushels per acre with a test weight of 53.0 pounds per bushel, while Quanah yielded 22.5 bushels per acre with a test weight of 59.0 pounds.

Bunt continues to cause losses in Texas, even though seed treatment is simple and well known. The growing of resistant varieties will aid in reducing these losses. Quanah and Comanche are resistant to the common races of bunt found in Texas. In disease-resistance tests, in which smut spores were placed on

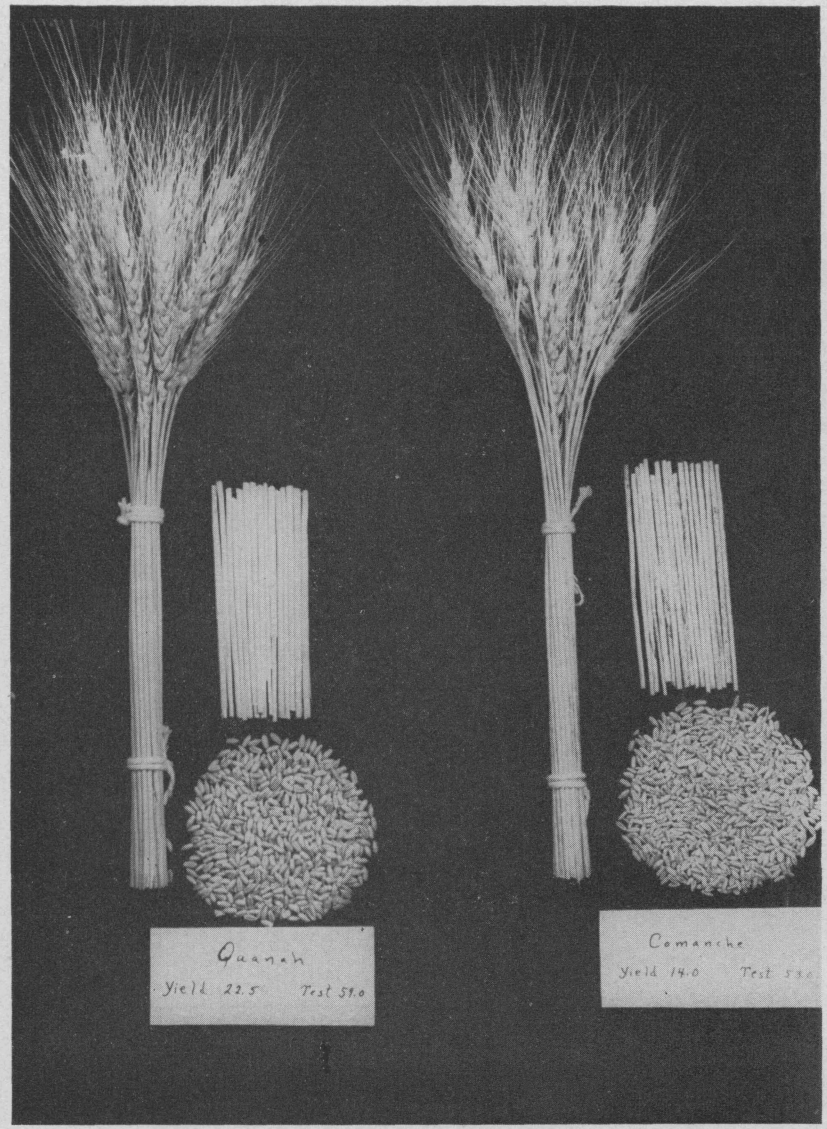

Figure 2. Sheaf, stem and grain samples of Quanah and Comanche wheat grown at Denton in 1949. Quanah (left) yielded 22.5 bushels per acre of 59.0 pounds test weight grain, while Comanche (right) yielded 14.0 bushels per acre of 53.0 pounds wheat. The low yield and low test weight of Comanche were caused by stem rust damage.

untreated seed, Quanah and Comanche developed only 1 percent bunt infection, while Kharkof developed 18 percent. In the regional tests, Comanche and Quanah averaged 9 percent bunt infection, while Kharkof averaged 37 percent. Although Comanche and Quanah are resistant to the prevalent races of bunt in Texas, seed treatment is recommended to improve germination and to reduce the chances of increasing rare races of bunt.

Quanah is highly susceptible to loose (head) smut, and farmers should guard against losses from this disease by seed treatment or the use of disease-free seed. Loose smut is favored by humid weather at flowering time; therefore, the disease is more serious in Central Texas than in the drier sections farther west. Dust fungicides will not control loose smut. Only the hot water method is effective. Sheaf and grain samples of disease-free Quanah wheat (left), Quanah resistant to bunt (center), and susceptible to loose smut (right), are shown in Figure 3.

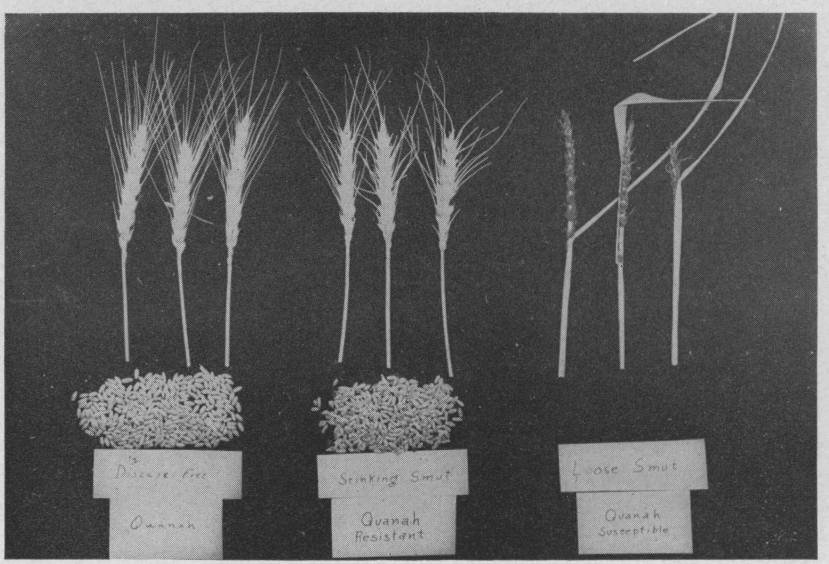

Figure 3. Sheaf and grain samples of Quanah wheat (left), stinking smut (bunt) to which Quanah is resistant (center) and loose smut (right) to which Quanah is susceptible.

Growth Characteristics

Quanah is similar to Comanche in general appearance. Comparative data on several plant characters are given in Table 3.

At Denton, Quanah and Comanche were similar in maturity and plant height, but Quanah averaged slightly higher in test weight of grain. In the regional test, Quanah averaged one day later in maturity than Comanche, about 1.5 inches shorter, and the two averaged the same in test weight. The straw of Quanah is strong and it lodged less than Comanche in the

Table 3. Characteristics of Quanah and Comanche wheats grown at Denton, 1946–50, and in the USDA regional nursery, 1947–50.

Character	Quanah		Comanche	
	Denton	USDA regional nursery	Denton	USDA regional nursery
Plant height, inches	33.3	35.0	33.0	36.7
Date first head	4–23	5–23	4–23	5–22
Date full ripe	5–27	.....	5–27	.....
Lodging, percent	.....	22.8	.....	30.3
Winter survival, percent	.....	45.0	.....	96.0
Test weight, pounds	59.7	58.5	57.7	58.5

regional test. In the seedling stage, Quanah is more upright in habit of growth; this characteristic may make it more subject to damage by livestock in pasturing. The foliage has a distinctive blue-green color under many conditions. The spike or head is bearded and of medium size.

Quanah has been damaged by low temperatures at the more northern stations in the regional test. For this reason, its average survival is less than Comanche, a fact which is reflected in lower yields when winters were severe.

Quality Characteristics

Milling and baking characteristics are of major consideration in the development of a new wheat variety, since it must fit into the needs of the trade. Wheat that will make good bakery flour is in greatest demand because commercial bakeries now supply most of the bread and pastries used.

Extensive quality tests were made by the Hard Red Winter Wheat Quality Laboratory at Manhattan, Kansas, comparing Quanah with commercial varieties over a 3-year period. In

Table 4. Summary of quality characteristics of Quanah, Comanche and Westar wheat grown in the USDA regional nursery, 1947–49.

Characteristic	Quanah	Comanche	Westar
Test weight, pounds	60.0	59.8	60.0
Wheat:			
Ash, percent	1.78	1.69	1.57
Protein, percent	14.3	13.4	12.7
Flour yield, percent	73.9	74.6	75.7
Flour:			
Ash, percent	.51	.49	.49
Protein, percent	13.1	12.8	11.9
Absorption	64.6	64.4	62.8
Mixing time, minutes	2.9	2.8	2.4
Potassium bromide requirement	3.3	3.0	2.4
Loaf volume	914	909	874
Loaf volume, corrected to 12.5 percent protein	886	903	920

addition, a 10-bushel lot of grain was tested for quality in the pilot mill of this laboratory. Flour from this lot of seed was tested by 18 commercial laboratories. The results indicate that Quanah is similar to Comanche in milling and baking characteristics, and is suitable for commercial bakery flour.

A summary of the quality characteristics of Quanah, Comanche and Westar wheat varieties, as determined on samples grown in the USDA regional nursery, 1947-49, is given in Table 4.

These samples, like the field-run samples, show that Quanah is slightly higher in test weight than Comanche.

Acknowledgments

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